

TABLE 2. Summary Radioactive Properties for Selected Radionuclides

Isotope	Half-Life	Specific Activity (Ci/g)	Decay Mode	Radiation Energy (MeV)		
				Alpha (α)	Beta (β)	Gamma (γ)
Americium-241	430 yr	3.5	α	5.5	0.052	0.033
Americium-242m	150 yr	9.8	IT	0.025	0.044	0.051
<i>Americium-242</i>	<i>16 hr</i>	<i>820,000</i>	<i>β, EC</i>	-	<i>0.18</i>	<i>0.018</i>
Americium-243	7,400 yr	0.20	α	5.3	0.022	0.055
<i>Neptunium-239</i>	<i>2.4 days</i>	<i>230,000</i>	<i>β</i>	-	<i>0.26</i>	<i>0.17</i>
Berkelium-247	1,400 yr	1.1	α	5.6	0.061	0.11
Californium-249	350 yr	4.1	α	5.8	0.043	0.33
Californium-251	900 yr	1.6	α	5.8	0.020	0.13
Cadmium-109	1.3 yr	2,600	EC	-	0.083	0.026
Cadmium-113 ⁿ	9.3×10^{15} yr	3.4×10^{-13}	β	-	0.093	-
Cadmium-113m	14 yr	240	β	-	0.019	-
Carbon-14 ⁿ	5,700 yr	4.5	β	-	0.049	-
Cesium-134	2.1 yr	1,300	β	-	0.16	1.6
Cesium-135	2.3 million yr	0.0012	β	-	0.067	-
Cesium-137	30 yr	88	β	-	0.19	-
<i>Barium-137m (95%)</i>	<i>2.6 min</i>	<i>540 million</i>	<i>IT</i>	-	<i>0.065</i>	<i>0.60</i>
Chlorine-36	300,000 yr	0.033	β, EC	-	0.027	<0.001
Cobalt-57	270 days	8,600	EC	-	0.019	0.13
Cobalt-60	5.3 yr	1,100	β	-	0.097	2.5
Curium-242	160 days	3,400	α	6.1	0.010	0.0018
Curium-243	29 yr	52	α	5.8	0.14	0.13
Curium-244	18 yr	82	α	5.8	0.086	0.0017
Curium-245	8,500 yr	0.17	α	5.4	0.065	0.096
Curium-246	4,700 yr	0.31	α	5.4	0.0080	0.0015
Curium-247	16 million yr	0.000094	α	4.9	0.021	0.32
Curium-248	340,000 yr	0.0043	α	4.7	0.0060	0.0012
Curium-250	6,900 yr	0.21	α, β	1.3	0.0016	-
<i>Plutonium-246 (25%)</i>	<i>11 days</i>	<i>49,000</i>	<i>β</i>	-	<i>0.13</i>	<i>0.14</i>
<i>Berkelium-250 (14%)</i>	<i>3.2 hr</i>	<i>3.9 million</i>	<i>β</i>	-	<i>0.29</i>	<i>0.89</i>
<i>Americium-246 (25%)</i>	<i>39 min</i>	<i>20 million</i>	<i>β</i>	-	<i>0.66</i>	<i>0.70</i>
Europium-150	34 yr	70	EC	-	0.044	1.5
Europium-152	13 yr	180	β, EC	-	0.14	1.2
Europium-154	8.8 yr	270	β	-	0.29	1.2
Europium-155	5.0 yr	470	β	-	0.063	0.061
Iodine-129	16 million yr	0.00018	β	-	0.064	0.025
Iodine-131	8.0 days	130,000	β	-	0.19	0.38
Krypton-81	210,000 yr	0.021	EC	-	0.0051	0.012
Krypton-85	11 yr	400	β	-	0.25	0.0022
Neptunium-235	1.1 yr	1,400	EC	<0.001	0.010	0.0071
Neptunium-236	120,000 yr	0.013	β	-	0.21	0.14
<i>Plutonium-236 (9%)</i>	<i>2.9 yr</i>	<i>540</i>	<i>α</i>	<i>5.8</i>	<i>0.013</i>	<i>0.0021</i>

Isotope	Half-Life	Specific Activity (Ci/g)	Decay Mode	Radiation Energy (MeV)		
				Alpha (α)	Beta (β)	Gamma (γ)
Neptunium-237	2.1 million yr	0.00071	α	4.8	0.070	0.035
Protactinium-233	27 days	21,000	β	-	0.20	0.20
Nickel-59	75,000 yr	0.082	EC	-	0.0046	0.0024
Nickel-63	96 yr	60	β	-	0.17	-
Plutonium-238	88 yr	17	α	5.5	0.011	0.0018
Plutonium-239	24,000 yr	0.063	α	5.1	0.0067	<0.001
Plutonium-240	6,500 yr	0.23	α	5.2	0.011	0.0017
Plutonium-241	14 yr	100	β	<0.001	0.0052	<0.001
Plutonium-242	380,000 yr	0.0040	α	4.9	0.0087	0.0014
Potassium-40 ⁿ	1.3 billion yr	0.0000071	β, EC	-	0.52	0.16
Protactinium-231 ⁿ	33,000 yr	0.048	α	5.0	0.065	0.048
Actinium-227 ⁿ	22 yr	73	α, β	0.068	0.016	<0.001
Thorium-227 ⁿ (99%)	19 days	31,000	α	5.9	0.053	0.11
Francium-223 ⁿ (1%)	22 min	39 million	β	-	0.40	0.059
Radium-223 ⁿ	11 days	52,000	α	5.7	0.076	0.13
Radon-219 ⁿ	4.0 sec	13 billion	α	6.8	0.0063	0.056
Polonium-215 ⁿ	0.0018 sec	30 trillion	α	7.4	<0.001	<0.001
Lead-211 ⁿ	36 min	25 million	β	-	0.46	0.051
Bismuth-211 ⁿ	2.1 min	420 million	α, β	6.6	0.010	0.047
Thallium-207 ⁿ	4.8 min	190 million	β	-	0.49	0.0022
Radium-226 ⁿ	1600 yr	1.0	α	4.8	0.0036	0.0067
Radon-222 ⁿ	3.8 days	160,000	α	5.5	<0.001	<0.001
Polonium-218 ⁿ	3.1 min	290 million	α	6.0	<0.001	<0.001
Lead-214 ⁿ	27 min	33 million	β	-	0.29	0.25
Bismuth-214 ⁿ	20 min	45 million	β	-	0.66	1.5
Polonium-214 ⁿ	0.00016 sec	330 trillion	α	7.7	<0.001	<0.001
Lead-210 ⁿ	22 yr	77	β	-	0.038	0.0048
Bismuth-210 ⁿ	5.0 days	130,000	β	-	0.39	-
Polonium-210 ⁿ	140 days	4,500	α	5.3	<0.001	<0.001
Radium-228 ⁿ	5.8 yr	280	β	-	0.017	<0.001
Actinium-228 ⁿ	6.1 hr	2.3 million	β	-	0.48	0.97
Thorium-228 ⁿ	1.9 yr	830	α	5.4	0.021	0.0033
Radium-224 ⁿ	3.7 days	160,000	α	5.7	0.0022	0.010
Radon-220 ⁿ	56 sec	930 million	α	6.3	<0.001	<0.001
Polonium-216 ⁿ	0.15 sec	350 billion	α	6.8	<0.001	<0.001
Lead-212 ⁿ	11 hr	1.4 million	β	-	0.18	0.15
Bismuth-212 ⁿ	61 min	15 million	α, β	2.2	0.47	0.19
Polonium-212 ⁿ (64%)	0.00000031 sec	180,000 trillion	α	8.8	-	-
Thallium-208 ⁿ (36%)	3.1 min	300 million	β	-	0.60	3.4
Samarium-146	100,000,000 yr	0.000024	α	2.5	-	-
Samarium-151	90 yr	27	β	-	0.020	<0.001
Selenium-79	650,000 yr	0.070	β	-	0.056	-
Strontium-90	29 yr	140	β	-	0.20	-
Yttrium-90	64 hr	550,000	β	-	0.94	<0.001

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				Alpha (α)	Beta (β)	Gamma (γ)
Technetium-97	2.6 million	0.0014	EC	-	0.0056	0.011
Technetium-98	4.2 million	0.00088	β	-	0.16	1.4
Technetium-99	210,000	0.017	β	-	0.10	-
Thorium-229	14 billion yr	0.00000011	α	4.0	0.012	0.0013
<i>Radium-225</i>	<i>15 days</i>	<i>40,000</i>	β	-	<i>0.11</i>	<i>0.014</i>
<i>Actinium-225</i>	<i>10 days</i>	<i>59,000</i>	α	5.8	0.022	0.018
<i>Francium-221</i>	<i>4.8 min</i>	<i>180 million</i>	α	6.3	0.010	0.031
<i>Astatine-217</i>	<i>0.032 sec</i>	<i>1.6 trillion</i>	α	7.1	<0.001	<0.001
<i>Bismuth-213</i>	<i>46 min</i>	<i>20 million</i>	α, β	0.13	0.44	0.13
<i>Polonium-213 (98%)</i>	<i>0.0000042 sec</i>	<i>13,000 trillion</i>	α	8.4	-	-
<i>Thallium-209 (2%)</i>	<i>2.2 min</i>	<i>410 million</i>	β	-	0.69	2.0
<i>Lead-209</i>	<i>3.3 hr</i>	<i>4.7 million</i>	β	-	0.20	-
Thorium-230 ⁿ	77,000 yr	0.020	α	4.7	0.015	0.0016
Thorium-232 ⁿ	7,300 yr	0.22	α	4.9	0.12	0.096
Tin-121m	55 yr	54	β , IT	-	0.035	0.0049
<i>Tin-121 (78%)</i>	<i>27 hr</i>	<i>970,000</i>	β	-	<i>0.11</i>	-
Tin-126	250,000 yr	0.029	β	-	0.17	0.057
<i>Antimony-126</i>	<i>12 days</i>	<i>85,000</i>	β	-	0.28	2.8
Tritium (H-3) ⁿ	12 yr	9,800	β	-	0.0057	-
Uranium-232	72 hr	22	α	5.3	0.017	0.0022
Uranium-233	160,000 yr	0.0098	α	4.8	0.0061	0.0013
Uranium-234 ⁿ	240,000 yr	0.0063	α	4.8	0.013	0.0017
Uranium-235 ⁿ	700 million yr	0.0000022	α	4.4	0.049	0.16
<i>Thorium-231ⁿ</i>	<i>26 hr</i>	<i>540,000</i>	β	-	<i>0.17</i>	<i>0.026</i>
Uranium-236	23 million yr	0.000065	α	4.5	0.011	0.0016
Uranium-238 ⁿ	4.5 billion yr	0.00000034	α	4.2	0.010	0.0014
<i>Thorium-234ⁿ</i>	<i>24 days</i>	<i>23,000</i>	β	-	<i>0.060</i>	<i>0.0093</i>
<i>Protactinium-234mⁿ</i>	<i>1.2 min</i>	<i>690 million</i>	β	-	<i>0.82</i>	<i>0.012</i>
Zirconium-93	1.5 million yr	0.0025	β	-	0.020	-
<i>Niobium-93m</i>	<i>14 yr</i>	<i>290</i>	IT	-	0.028	0.0019

This table summarizes key radioactive properties of selected radionuclides and their associated decay products (for which information is presented in italics). Values are given to two significant figures. See the radionuclide-specific fact sheets for further information. EC = electron capture, IT = isomeric transition, Ci = curie, g = gram, and MeV = million electron volts. A dash indicates that the entry is not applicable, and an “n” indicates that the isotope exists naturally in the environment. (See the companion fact sheet on *Radioactive Properties, Internal Distribution, and Risk Coefficients* for an explanation of terms and interpretation of radiation energies.)